CEO age, compensation contracts and risk-taking

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ABSTRACT

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Empirical evidence has found a consistent association between younger CEOs and a higher level of risk in their corporate policies. This is inconsistent with career concerns theory, which suggests younger CEO does not want to damage their future career prospect with failed risky decisions. Empirical evidence suggests that Duration (of compensation contract) along with overconfidence and tenure do not cause the negative relation between CEO Age and risk tolerance (which is measured by stock returns volatility and R&D intensity). On the contrary, I find older CEOs (more than 50 years old) respond negatively and significantly to increases in Duration when younger CEOs do not. More broadly, longer-duration compensation contracts make CEOs more hesitant to take risks and this type of contracts are given significantly more to younger CEOs. This suggests boards of directors may be giving CEOs suitable compensation contracts to control the risk tolerance of these managers. In addition, there is no difference in the magnitude of the impact of Duration on riskiness measures in first time CEO compared to CEOs who held the position before. Similarly, there is no evidence that suggests Duration has an impact on measures of M&A activities.

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1. Introduction

In the day-to-day running of a business, a CEO constantly makes decisions for the firm that can affect her future prospects. If the firm performs well, the talent of the CEO will be appreciated and vice versa. Being the well - informed decision makers, CEOs are usually aware of the development in the market that would subsequently affect their decisions. This is the argument of career concerns theory, which was initially discussed by Fama (1980) and Holmstrom (1999). The theory predicts that young CEOs with a long career ahead of them would theoretically prefer to take less risk so as not to damage their future prospect. On the other hand, older CEOs would prefer more risk as they can prioritize gains with a now shorten career. Holmstrom (1999), Dechow and Sloan (1991), Gibbon and Murphy (1992), Graham et al. (2005) and numerous studies provide theoretical models and empirical evidence to support the theory and its effects on decision making of CEOs.

However, recent empirical evidence finds contrary to the tried and true career concerns arguments, specifically risk-taking activities in businesses. Serfling (2014) find a negative relation between the age of CEO (CEO Age) and stock returns volatility and risky investments. Furthermore, Yim (2013) shows that young CEOs are more likely to engage in a Merger and Acquisition (M&A) transaction, and there is a boost in the compensation of the CEO when the M&A deal succeed. These evidences are inconsistent with career concerns theory, which predicts that a young CEO would prefer less risk in her decision so as not potentially damage her future prospect. There are a number of reasons that can lead to this discrepancy.

Younger CEOs may be trying to prove themselves or to find further success. Prendergast and Stole (1996) show that CEO can exaggerate the importance of their own information to look talented when the information pays off. Young CEOs have more to

gain from their longer remaining career and therefore would be more willing to risk failures.

Young CEOs may also be overconfident in their ability to increase their edge in risky situations. Malmendier and Tate (2005, 2008) confirm the existence of overconfidence in CEOs. I use a proxy for overconfidence suggested by these authors which is the proportion of outstanding unexercised exercisable options they have in their compensation portfolio. There is not definitive proof that younger CEOs are more overconfident. The evidence has been mixed. Some psychological researches find younger subjects to be more overconfident (Kovalchik et al., 2005; Forbes, 2005) while others find older subjects to be more overconfident (Doukas and Petmezas, 2007; Billett and Qian, 2008). This paper hopes to provide some additional useful insights into the impact of overconfidence in young versus older CEO on corporate decision making.

Young CEOs may be paid to take more risk. Previous research (Jensen and Murphy, 1990) has documented the effect of the compensation contract on decision making of CEOs, especially the effect of equity compensation (restricted stocks grants, stock options, etc). Equity compensation can change the exposure of the private wealth of CEOs to the stock price of the firm and through that affect the risk portfolio of the executives. It is also possible that with similar compensation contract, young CEOs are interpreting differently from their older counterparts. There are many possibilities of dynamics between CEO Age and compensation contracts and this paper will explore some of these interaction effects.

Although stocks and options have been an important component of compensation contracts for decades, we only just recently have the reliable data to test their effect on decision making. On December 12th, 2004 the Financial Accounting Standard Boards (FASB) issued the Financial Accounting Standard (FAS) 123-R, which requires fair value assessment and record of employee stock options. All options granted after June 2005 and unvested options granted after 1994 are required to have valuations in financial reports. This means that firms with large amounts of unvested options granted to

employees face significant accounting cost to comply with the new accounting standard. However, to avoid the cost, the FASB allows firms to accelerate their options to vest before the effective date of FAS 123-R. The new standard allows a new source of data on an unexplored dimension of compensation contracts of CEOs for academics and opens new lines of research into the effects of compensation on decision making of CEOs.

With the data on equity compensation, I construct the duration of compensation contracts for S&P 1500 CEOs or the variable Duration. Duration represents the average years to vesting of equity compensations of S&P 1500 CEOs. For example, a Duration of 10 represents a much longer time to vesting and a much longer horizon than a Duration of 1 or 2. I then test whether the horizon set by compensation contracts would influence the risk-taking activities in firms, through the medium of CEO decisions.

In order to perform empirical tests, I assemble a data set of S&P 1500 firms for the years from 2013 to 2016. The final sample consists of 5207 CEO – year observations. To explain the effect of the compensation contract and CEO Age on risk tolerance of CEOs, I run OLS regressions of riskiness measures of the firm on compensation duration (Duration), CEO Age (Age), and control variables. The dependent variables or riskiness measures are Stock returns volatility, R&D intensity and capital expenditure (CAPEX).

I find that Duration and Age both have negative and significant relations to the overall firm risk as well as R&D expenditure (which is the proxy for risky investments). The result suggests that longer-duration contracts and older CEOs are associated with a lower level of risk in stock price and investment activities of the firm. On the other hands, by dividing the sample into groups and run separate regressions, I find that older CEOs responds significantly to Duration when young CEOs do not. This is consistent with career concerns theory.

Moreover, I find a significantly negative relation between Duration and CEO age, which means younger CEOs are given longer duration contracts. Therefore, it is likely that the board is aware of the tendency of younger CEOs to take more risk and they are giving

them longer duration contracts in an attempt to discourage excessive risk-taking activities.

In addition, I do not find any statistically significant difference in risk-taking in the influence of Duration of compensation between two pairs of sub-groups. There is no significant difference in the change of riskiness measure for each change in Duration between young CEOs (<50 years old) and older CEOs (>50 years old). This is also the case for two sub-groups multiple time CEOs and first time CEOs. This means the magnitude of the impact of Duration on riskiness measure on multiple time CEOs is not significantly different from first time CEO. These results may be explained by the straightforward interpretation on Duration or the vesting period of equity compensation.

The rest of the paper is organized as follow. Section 2 presents related literature reviews and the development of hypotheses. Section 3 discusses the collection and treatments of data along with chosen methodology. Section 4 presents the results of empirical tests and their implications. Section 5 concludes the research.

2. Literature reviews and hypothesis development.

2.1. Agency theory

The principal-agent problem as discussed by Pauly (1968) and Arrow (1971) persistently presents in modern shareholders – CEO relationship. Shareholders are protected by limited liabilities; therefore, their only objective is assumed to be maximizing value from their investments in companies. They would approve any project with a positive expected value which would net them consistent average value across many projects. Theoretically, shareholders are regarded as risk-neutral agents.

However, shareholders often do not have the expertise to run the day-to-day business. Therefore, they hire managers to represent their interest in the firm. However, managers bear their own risk and have their own agenda and objectives, for example, wealth gains, job security or reputation. In addition, managers often have a strong

position in the firm along with a substantial financial reward for their work, therefore they would like to keep the stable occupation and income. That would lead to some risk-averse behaviors from managers and CEOs specifically so that they do not damage their career prospect.

The risk-aversion of CEOs can easily affect corporate policies and hence conflict with the objective of shareholders. That is the classic principal-agent problem which is described by the agency theory. The usual solution to this problem is to offer CEOs compensation to induce them to accommodate shareholders' interests and take more risk than they would personally take (Jensen & Meckling, 1976). Stock pays are then introduced and stocks reward manager for any good performance as they are translated to stock price increases. This gives CEOs tangible stakes in the firm and hence induce them to think like one of the shareholders. As a result, acting in the interest of shareholders is easier since it would be similar to acting in the CEO's own interest. At the same time, stock holdings expose managers to losses in wealth when the stock is not performing well (Guay, 1999). This could deter some managers from taking risks. Therefore, options are proved to be more effective in inducing risk-taking behaviors. Options eliminate the downside exposure of managers. They are now solely rewarded when stocks perform well. This is the reason why options and similarly restricted stock grants have become popular in modern compensation contracts.

2.2. Career concerns and the horizon problem.

Career concerns arise when the labor market looks at the present performance of CEOs to base future compensation, promotion or appointment decisions (Gibbon and Murphy, 1992). Career concerns were first discussed by Fama (1980) when he introduced a moving average process to wage revision of managers and considered managers' wage can be related to the current expected value of her marginal product, in that, high-wage offers will go to managers with superior performance, while low-wage offers would go to managers with poor performance. Fama also argues that incentive contracts are not

necessary to discipline managers. They have the incentives to increase their output for higher wages in their firms or in the labor market in general. This relation should be essential for the labor market's process of evaluating executives.

Holmstrom (1999) offered a model that said the discipline of the labor market is not enough to align the interests of managers with those of shareholders. Without incentives contracts, managers would work too hard in the early year to provide information about their ability, and they would not work hard enough in later years. Holmstrom (1999) make the prediction with the dynamic side of career concerns. The labor market is looking to measure the talent of managers through a learning process and they are constantly gathering information to update their belief and evaluate managers to find the best talents. Career concerns suggest that managers are constantly working hard to provide good outputs, which is the primary source of information for the market, to bias the measurement process in their favor. The market often anticipates this level of efforts going into outputs and update their expected level of output. However, there is still the shortfall of producing under the market equilibrium and hence being assessed negatively by the market. Thus executives still have to put a lot of efforts to stay current in the market. This is called the reputation effect, where managers work hard for no apparent benefits (excluding the effect of compensation contracts at this point) apart from signaling the labor market.

Gibbon and Murphy (1992) provide theoretical and empirical evidence that the older the managers, the more sensitive their optimal contract wage must be to their output. It shows that career concerns are more prominent for younger managers (and workers in generals) and their total incentives are less dominant by compensations. Therefore, for managers who are closest to retirement, their incentives are tied the most to compensation which means the least career concerns.

Empirical evidence has been provided to examine the predictions of Fama (1980) and Holmstrom's (1999) models. Gibbon and Murphy (1992) find that compensation is more sensitive to change in shareholders' wealth for managers who are close to retirement

than younger managers. On the other hand, incentives from compensation contract increase constantly with age. Brickley et al. (1999) provide evidence of career concerns through the positive relation between accounting and stock market performance and the probability of post-retirement service at the board. In a non-executive context, Chevalier and Ellison (1999) provide support that younger mutual fund managers do not have the reputation to fall back on and thus are more likely to be fired from poor performance and failed risky investing strategies. Hong et al. (2000) discuss herd behaviors in earnings forecasts due to career concerns as younger analysts are punished more harshly for poor forecasting performance and forecasting boldness. Graham et al. (2005) find that career concerns such as building creditability with the labor market, improving the reputation of the management team and improving stock performance motivate managers to engage in earnings management.

As CEOs get older, their career concerns diminish. Addressing the phenomena, Smith and Watts (1982) discusses the horizon problems, which are opportunistic behaviors managers take as their horizon grow shorter and focus on short-term performance rather than long-term value creation for the firm. They suggest managers with a shorter decision horizon have the incentives to choose projects with higher current accounting earnings even if they produce a lower net present value than others. Dechow and Sloan (1991) find supporting evidence for this hypothesis through the reducing research and development (R&D) expenses as CEOs approach their final years in office. R&D expenditures are considered long-term and uncertain investment, which does not help the present performance of the firms. This is consistent with the prediction of Gibbon and Murphy (1992) that CEOs have incentives to focus on short-term performance to increase their compensation from stock returns through their equity ownership. However, Murphy and Zimmerman (1993) find little support for the relation after controlling for endogenous CEO turnover and firm performance. They find that in well-performing firms where CEOs retires as part of a relay process there are little discretions in R&D activities. Cheng (2004) find no association between CEO turnover and R&D expenditure.

2.3. Risk-taking behaviors of CEO

The literature identifies the horizon problem of possible opportunistic behaviors caused by CEOs or executives short horizon. However, empirical research finds little evidence to support the full scope of the stated problem. At the same time, there is plenty of evidence suggesting that the problem associated with horizon is related to retirement rather than turnover or succession. This is however consistent with career concerns: turnover CEOs would still have a future career and therefore less likely to engage in opportunistic endeavors that could potentially damage future prospects.

There is plenty of evidence supporting an inverse relation between CEO age and the riskiness of their action. Barker and Mueller (2002) find an inverse relation between CEO age and R&D expenditure after controlling for strategy, firms and managerial ownership. Serfling (2014) finds a more general conclusion which associates CEO age with a lower riskiness of corporate policies such as stock returns volatility, R&D intensity and operating leverage. Yim (2013) finds that "a firm with a CEO who is 20 years older is 30% less likely to announce an acquisition."

Career signal hypothesis

Building on the arguments of career concerns, it is possible that younger CEOs are taking on more risk to send signals to the labor market, which is uncertain about the true ability and talent of young CEOs. Good output level can bias the evaluation procedure upward for any individual executives. Prendergast and Stole (1996) developed a model which demonstrates the career signal hypothesis. It is built on the assumption that the market evaluates an executive by her output and the accuracy of information that is used to shape her decisions. They show that a CEO will overreact to new information and exaggerate their opinion in the short term (which is risky) to appear talented and through that way build up their reputation. This would lead to a larger variance and thus more risk. A young CEO would benefit more from her longer remaining career and be more inclined to send signals about her ability to the market and hence willing to take more risk to do so.

Influence of overconfidence

Overconfidence is one of the cognitive biases recognized by economic theory. Malmendier and Tate (2005, 2008) measure overconfidence in CEOs by examining their option holdings. A manager is classified as overconfident if she holds options until they are close to expiration or consistently buy stocks of her company. The paper published in 2005 finds that the investment policies of overconfident managers are more sensitive to cash flow, which means overconfident managers invest more than the rest when cash flow increases. Malmendier and Tate (2008) also find that overconfidence CEOs are more likely to initiate mergers on average. This is consistent with the intuition that overconfidence CEOs would take on more risk through increased investments and more mergers. Therefore, it is plausible that a higher overconfidence level causes young CEOs to take high-risk actions.

Influence of compensation contract or duration of compensation contract

Compensation structure has been known to affect CEOs' attitude towards risks. Jensen and Murphy (1990) find that CEO compensation is linked to firm value, through insider ownership and stock options. The goal of shareholders would be aligning CEO's objective with the objective of the firm or tying their wealth to stock prices. This gives the CEOs a linear exposure to stock price which means they would benefit if the firm performs well and get punished if stock prices fall. Risk-averse CEOs would not want to risk losing her own wealth if the firm does not perform and therefore be discouraged from taking risks.

Boards of directors are aware of the problem and have been including stock options in compensation packages. Unlike stock holdings, stock options eliminate the downside risk, which means less punishment for taking risks and bad performance in general. This offset the concave utility function of risk-averse managers. Therefore, stock options are more effective in encouraging CEOs to take risks. Guay (1999) provides that the convexity encourages CEOs to tolerate more risk in their policies and not just increase stock prices. This is significant as Jensen and Murphy (1990) find stocks and options is the largest

component of the relation between the wealth of CEOs and the wealth of shareholders. Therefore, limiting downside risk would be detrimental in reducing CEO risk aversion.

However, short-term stock-based compensation can also encourage myopic behaviors. Edmans, Fang, Lewellen (2017) find that CEOs take less risk in form of rejecting risky projects, manage earnings, etc. when their benefits from restricted stocks and options are close to vesting. This suggests that a shorter horizon of compensation may motivate CEOs to take less risk.

Brisley (2006) examined the specificity of the incentives that CEOs derive from long maturity options. He finds that when options go deep in the money, they lose their convexity and CEOs are exposed to a straight line pay-off +until stock price falls back to strike price. His model shows that the exposure affect CEOs' risk aversion and would result in more conservatism in their private risk portfolios, project selections, etc. The model also finds an early exercise provision can help the CEO realize the gain right away and stop the impact of in-the-money options on risk-taking. In summary, this suggests that a longer duration of compensation may increase risk-aversion in the decision making of CEOs. The effect of compensation duration will be examined empirically.

2.4. CEO Tenure and CEO reputation

Tenure likely reflects the influence of the CEOs on the board. Over time, CEOs can nominate new board members, giving them a personal connection and some power over the nominees (Pfeifer, 1972; Herman, 1981). Finkelstein & Hambrick (1989) argues they can also remove opposition from the board. Fredrickson, Hambrick, and Baumrin (1988) support this line of reasoning by showing a vulnerable period for the CEO after appointment. The longer the CEOs tenure, the board get shaped more in favor of the CEO, the larger the influence of the CEO on the board will be. With this power, CEOs can exercise more influence over the board decisions. In this case, we are interested in the decision of compensation given to the CEO. In addition, Wolfson (1984) states that CEOs held knowledge of the inner working of the firm, and other directors often rely on the

CEO, and a long-tenured CEO in particular, to obtain information about the firm. Furthermore, CEOs can be replaced if they do not perform well (Salancik & Pfeffer, 1980; Brown, 1982). Therefore, a long-tenured CEO is likely to have good performances in the past. A good track record can give respect to the arguments and decisions of CEOs, which will give them a better chance to go through the board. In short, with more power (often a result of a long tenure), CEOs are in a better position to circumvent board control and negotiate a better compensation contract.

Agency theory states the desire of shareholders to align their interest with the interests of CEOs so that executive truly represent investors' interests in the firms. Therefore, shareholders would prefer a stronger link between CEO pay and performance to incentivize CEOs to create wealth (Grossman & Hart, 1983). Larcker (1983) argues that the strong link will also minimize CEO shirking.

CEOs prefer more pay, more cash since with more stocks, they are exposed to downside risk when stock price decline. Hill and Phan (1991) document that stocks will also expose CEOs to factors that are out of their controls e.g. aggregate demand, overall stock market performance, inflation. Although stocks reward good performances, they shift some risk bearing burden from shareholders to CEOs. In short, CEOs prefer their compensation duration to be shorter and shareholders prefer the duration to be longer.

Simsek (2007) finds a positive relation between CEO tenure and the risk-taking propensity of the top management team. The authors describe long-tenured CEOs as seasoned executives who are familiar with the operation and environment of her particular firm and hence are more confident and more equipped to take on more strategic risk.

2.5. Hypothesis development

The executive labor market is constantly looking to evaluate the abilities of their participants to find the most valuable recruits for the corporations. Their main source of

information is the productivities of the executives and the performance of their firms. CEOs are evaluated in the same way and they monitor their performance for current and future job prospect. This is often referred to as career concerns. Career concerns predict that younger CEOs have a long future career ahead and hence are discouraged from taking too much risks that could damage their future prospect.

However, empirical research has established a pattern of younger CEOs seemingly taking on more risk than older ones (Selfing, 2014; Yim, 2013; Barker and Mueller, 2002). Young CEOs spend more on risky investments and M&As, which imposes risks on their principal firms and their own careers. This is inconsistent with career concerns theory which suggests failure early on in ones' career will affect future prospects (Gibbon and Murphy, 1992; Holmstrom, 1999).

One possible explanation for the pattern is that managers want to signal their ability and talent to the market. Prendergast and Stole (1996) discuss this pattern and explain it through the competitive labor market, which assesses and evaluate the abilities of managers based on their observable output and performance. In particular, young CEOs have the incentive to take on more risks for the chance of superior performances compared to her peers.

Another explanation is the incentive derived from their compensation contract. Compensation contract affects risk-taking behaviors. Agency theory cautions of possible risk-aversion in the actions of CEOs. CEOs in their esteemed positions and considerable financial rewards would not want to take risks that would damage their career. This effect is specifically prominent with younger CEOs who have more serious career concerns. It is possible that boards are aware of the career concerns of young CEOs and give them short duration contracts to motivate them to take more risk. This informs my first hypothesis:

H1: Controlling for CEO compensation and overconfidence, younger CEOs prefer less risk than their older counterparts due to career concerns.

H1a: Controlling for CEO compensation and overconfidence, younger CEOs prefer more risk than their older counterparts to suggest their potential to the labor market.

Melmendier and Tate (2008) state that overconfident executives are more tolerant toward risks and more likely to take on M&A activities. They quantify overconfidence in terms of the amount of unexercised vested stock options and its effect on decision making. Overconfident CEOs hold vested options in anticipation of good performance and better stock price as a result. With such optimistic expectation, they would be more likely to take on risk to benefit from their compensation, especially stock-based compensation. Therefore I expect overconfident CEOs to be more sensitive to the duration of their compensation contracts.

There are mixed results from research in psychology about changes in overconfidence with age, depending on its origin. If overconfidence comes from self-attribution and survival, older CEOs will be more overconfident (Doukas and Petmezas, 2007; Billett and Qian, 2008). If the origin is cognitive bias and desire for actions, younger CEOs will be more overconfident (Kovalchik et al, 2005; Forbes, 2005).

Career concerns exist when the labor market observes its participants performance to evaluate their position prospect and compensation. As age increases, the length of their career shortens and career concerns decrease. That means older CEOs concern less about future career and more about their compensation. Therefore, I expect older CEOs to be more sensitive towards their compensation contract.

H2: Older CEOs are more sensitive to the duration of their compensation contract which will manifest through a higher sensitivity of riskiness measures toward changes in Duration.

There is currently no literature on CEOs who is holding the position for the first time. Therefore, I theorize that first time CEO would have many other concerns other than her compensation e.g. getting to know the job, the specifics of the firm, working with the board, getting a good performance. Hence, I expect first time CEOs to be less sensitive towards their compensation contract.

H3: First time CEOs are less sensitive to their duration of compensation contract which will manifest through a lower sensitivity of riskiness measures toward changes in Duration.

3. Data and methodology

3.1. Data

In order to calculate the duration of CEOs' compensation, I require the vesting schedules of their granted options, restricted stock grants and other long-term compensation, which is not available through publicly available databases. The vesting schedules of these grants are obtained through Equilar Inc. who collects the information through corporate filings. The information available from Equilar Inc. include the name of CEOs, firm name, year of grants, type of grants (generally option, restricted stock grant, long-term cash; grants can be further classified by annual awards, new hire award, special awards, etc) vesting schedule (of executive compensation), vesting period, grant date present value of each grants and performance criteria if applicable.

Due to the lacking of information to evaluate whether the performance criteria are met (namely the actual value of the objectives), I disregard the performance components and treat them similarly to other grants. The dataset contains information on compensation for CEOs from S&P 1500 firms from 2013 to 2016 (newest period where all needed data are available). The original data has 19,992 observations, which are aggregated into the final data set of 5,207 CEO – year combinations (average 3.6336 grants per CEO-year). Names of CEOs come in the form of (Last name, First name) which does not match with the full name from other databases (i.e. Execucomp). However, the separate components of the name are available from Execucomp and can be combined to create a matched identity with the Equilar dataset. With the inclusion of this step, the two databases merge reasonably well with rare misses. Other information is matched by tickers (provided within the data set) and CUSIPs (matched from tickers).

I obtain compensation information for CEOs from Execucomp, namely names of CEOs, total compensation, current compensation, CEOs' age, unexercised exercisable options (a proxy for overconfidence) and tenure. COMPUSTAT provides firms accounting and more firm-specific data and CRSP provides information on stock price/returns. The final dataset has the form of panel data and I include year and industry fixed effects (2-digit SIC code) for all presented regression results.

3.2. Methodology.

Dependent variables

I use OLS regression models to establish relationships between the variables. Since this is an effort to determine the effect of compensation on decision making and risk-taking behaviors of CEOs, dependent variables of the models will be measurements or proxies of such activities. The first of these variables is Stock returns volatility, which is a proxy for overall firm risk. In order to calculate the needed yearly volatility to go with other yearly data, I use stock returns data obtained from CRSP and calculate the standard deviation of usually 12 monthly stock returns values.

The second dependent variable chosen is R&D intensity, which represents the amount of risky investments that a firm commits to in a year. R&D intensity is defined as total R&D expense divided by total assets, which are both available from COMPUSTAT. R&D expense calls for some attention in treatment because it is not as well populated in COMPUSTAT compared to other variables. There have been practices that missing value can be set to 0. However, it is possible that the missing value can include firms with high levels of R&D, therefore setting R&D to 0 can disturb the estimation of other regression coefficients. Thus, I choose to drop the observations with missing R&D value from the final presented model. My final model with R&D includes 2975 observation.

The third dependent variable is CAPEX which measures long-term investment. CAPEX is one possible channel for the CEO to influence firm risk. The variable used in the model is scaled by total assets of the corresponding firm.

Independent variables

Duration: I use Compensation duration as a proxy for the impact of compensation contracts on the decision making horizon of CEOs. The measure was first systematically developed and documented by Gopalan et al (2014). Conceptually, it treats the vesting of options similar to the payments from fixed income bond and derives a duration in the same way. Cliff vesting payments which vest all at once are treated like zero coupon bonds and given a duration of its time to vesting (e.g. a payment which vests in 3 years has a duration of 3). Graded vesting payments, which vest an equal portion every year, are treated like coupon bonds and given a duration of (N+1)/2 (in which N is the vesting period of the grant). The measure gives me an average of vesting schedules of CEOs equity compensation. I expect that the duration of compensation has an impact on the decision-making process of CEOs or in other words, a significant relationship between compensation duration and measure of the riskiness of firms.

Following Coles et al. (2006) and Serfling (2014), I include some variables that potentially correlate with riskiness measures, CEO age and Duration. Specifically, they are: (i) log of assets which controls for firm size, (ii) tenure which arguably controls for the influence of CEOs on the board according to Fredrickson, Hambrick, and Baumrin (1988), (iii) cash compensation which may have an impact on risk tolerance and investment, (iv) overconfidence which is proxied by the amount of unexercised exercisable option holdings of the CEO (Malmendier and Tate, 2005), (v) stock returns which affect CEO wealth, (vi) cash holdings which affects capability to take risks, (vii) book-to-market ratio which controls for growth opportunity, (viii) ROA which controls for profitability, (ix) Leverage which can affect costs of risk-taking, (x) Dividends which is in the same vein as cash, if a firm pays out lots of dividends, there may be less cash left and (xi) Sales growth which controls for the rate of growth of the firm.

3.3. Duration calculation

Following Gopalan et al. (2014), I calculate a measure of Duration of CEO compensation with the formula as follow:

$$\text{Duration} = \frac{\sum_{i=1}^{n_s} \text{Restricted stock}_i \times t_i + \sum_{j=1}^{n_s} \text{Option}_t \times t_j}{\sum_{i=1}^{n_s} \text{Restricted stock}_i + \sum_{j=1}^{n_s} \text{Option}_t} \quad (1)$$

where n_s is the number of restricted stock grants for one CEO in a year, n_o is the equivalent for stock options granted, t_i is the duration factor for a particular restricted stock grant i and t_j is the duration factor for a particular option j. It is straightforward to obtain the duration factor for cliff vesting grants, the factor is the vesting period (time to exercisable/vest) of such grant. In the case of graded vesting grants, with the vesting period t, the duration factor is (t+1)/2.

I also use the original formula from Gopalan et al. (2014) as a measure for Duration which is:

$$\text{Duration wcc} = \frac{(\text{Salary} + \text{Bonus}) \times 0 + \sum_{i=1}^{n_s} \text{Restricted stock}_I \times t_i + \sum_{j=1}^{n_s} \text{Option}_t \times t_j}{(\text{Salary} + \text{Bonus}) + \sum_{i=1}^{n_s} \text{Restricted stock}_I + \sum_{j=1}^{n_s} \text{Option}_t} \quad (2)$$

The difference between the two measures is the inclusion of the cash component of CEO compensation which is the sum of her Salary and Bonus. I left the cash compensation component out of the first duration measure due to the dynamic between compensation and risk-taking activities. Guay (1999) points out that it is the stock holding of CEOs and her equity payment that links CEOs' own wealth and risk portfolio to the stock price of the firm. This forces CEOs to take her own wealth into consideration when making a decision for the firm e.g. a risky venture going wrong can do damage to the wealth of the CEO. Therefore, I am mostly interested in the impact of equity compensation on the risk portfolio of the firm. Current compensation does not have the same impact.

4. Results

4.1. Descriptive statistics and correlation table

Table 1 presents the descriptive statistics of the variables used in empirical tests. The first variable of interest is CEO Age (Age) which has the mean of 57.04. The youngest CEO in the sample is 34 years old and the oldest is 93 years old. The second variable of interest is Duration, which has the mean of 2.19 and the standard deviation of 0.71. This also means that two third of the Duration data is between 1.48 and 2.9. The low standard deviation means Duration concentrates around the mean.

Similarly, the four dependent variables also concentrated around the mean and they are positively skewed with low standard deviation with some extremes. Stock returns volatility has the mean of 0.08, standard deviation of 0.04 and maximum 0.72; the respective measures for R&D intensity are 0.04, 0.06 and 0.58; the respective measures for CAPEX are 0.04, 0.05 and 0.48.

T-test for differences in means between age groups

I split the full CEO sample into three groups which are Young (50 years old or younger), Middle (between 51 and 60 years old) and Old (over 60 years old). I then perform t-tests to find the differences in means of characteristics between the age groups. The universal null hypothesis is the mean of a characteristic (e.g. Duration, Overconfidence and Tenure) of one age group is not different in comparison to another age group. Table 2 shows the results of the t-tests.

I find the mean Duration for CEOs in the Old group to be lower than the other two (Young and Middle, whch have equal means of Duration). In addition, CEOs in the Young group tend to work for smaller firms with higher stock returns volatility and higher R&D intensity. Furthermore, CEOs in the Young and Old groups have the same level of overconfidence. The mean overconfidence measure for the Old group (1.8664) is statistically higher than the Middle group (1.5254) but not higher than the Young group (1.7257).

Correlation table

Table 3 presents the Pearson correlation coefficients for all variables in the regression models. Disregarding very similar variable (Duration – Duration wcc, Stock returns volatility – idiosyncratic risk), there is almost no correlation problem between variables. The pairs of variables which have a high correlation coefficient are Age - Tenure (0.45) and Duration wcc (with cash compensation) - cash compensation (-0.42). The highest correlation involving log of assets (size) is with idiosyncratic risk (-0.36). All variance inflation factors do not point out any multicollinearity problem, except for the models with interaction terms.

4.2. Duration and firm riskiness measures.

In order to establish the relation between duration of compensation contract and risk-taking activities, I build OLS models with Stock returns volatility, R&D intensity and CAPEX as dependent variables. Stock returns volatility proxies for overall firm risk. Risky business activities attract attention, especially for large, famous and closely followed (by specialists) firms. Information from risky activities is reported and reflected in stock prices and its volatility. Higher stock price volatility indicates more risky risk portfolio from the corresponding firm. R&D is considered risky investments as it takes away resources from the day-to-day operation and does not guarantee breakthrough or successes. Higher R&D expenses usually mean a higher tolerance toward risk. CAPEX represents long-term investment activities of firms. Higher CAPEX means the firm is investing more.

I expect the independent variables of interest which are Duration to be significant and Age to be insignificant. Table 4 report the results for the regression models. All models include industry fixed effects and year fixed effects.

Column 1 demonstrates the result of the model with Stock returns volatility. The model has a fitness measure R^2 of 0.3823, which means the model explains 38.23% of the variation in Stock returns volatility. Note that this R^2 measure includes the explaining

power of the industry and year fixed effects. Without these indicator variables, R^2 stays at 0.2735. In the fixed effects model, the variable Age has a coefficient of -0.0001, which is significant at 10% level of confidence. This suggests older CEOs take less risk and younger CEOs tend to show a higher level of risk, which is reflected in overall firm risk. This is consistent with Yim (2013) and Serfling (2014) who report a similar pattern. The result supports the career signal hypothesis, which suggests that younger CEOs take more chances since if they succeed, they would look talented and gain more benefits with their longer remaining career (Prendergast and Stole, 1996).

Meanwhile, the coefficient of Duration is -0.0026, which is significant at 1% level. This means when Duration increases by one, Stock returns volatility decreases by 0.0026. In the case of long duration contract, a CEO with a Duration of 10 (longest in the sample) can be expected to exhibit a Stock returns volatility 0.0182 lower in than a CEO with a Duration of 3 (which would consist of only the most popular vesting period – 3 years). This specific difference is 45.5% of a standard deviation of Stock returns volatility. The number indicates a small economic significance in the relation.

This result supports Brisley (2006), who suggests that stock options with longer durations are more likely to get in-the-money in the course of its vesting period and subsequently creates a paper gain for the CEO who holds the options. Therefore, CEOs are more hesitant to damage that gains through risky decisions.

To investigate the effect of compensation duration on firm risk more closely, I rerun the model on the unsystematic component of firm risk. Column 2 shows the result of this evaluation. In that case, the coefficient remains significant at -0.0022, which is less in terms of absolute value than -0.0026 in the Stock returns volatility model. This suggests Duration does affect stock returns volatility through unsystematic risk-taking activities which include investment project choices.

Column 3 demonstrates the result of the model with R&D intensity. The model has an R^2 of 0.4462 which means 44.62% of the variation in R&D intensity is explained. Similar to firm risk, the coefficient for Age is negative and significant, which supports the career

signal hypothesis. Duration has a coefficient of -0.0024, which is significant at 5% level. This means when Duration increases by 1, R&D intensity decreases by 0.0024. In the case of long duration contracts, a seven years increase in duration is expected to lead to a decrease of 0.0168 in R&D intensity, which is 28% of a standard deviation of R&D intensity. This result supports Brisley (2006) who suggests that longer duration options and stock grants will likely go in-the-money at some point in the future and that would cause CEOs to be more careful not to lose that gain to failed risky activities.

CAPEX is one of the other possible channels for the CEO to adjust the level of risk of the firm. Column 4 shows the regression result with CAPEX as the dependent variable. The model has an R^2 of 0.5054, which is higher than the other previously mentioned models. However, both Age and Duration is not significant in this model. I rerun the model without the fixed effect to find a very low R^2 (0.0458) and Duration (not Age) is negative and significant at 1% level. This suggests CAPEX varies more with the calendar years and industries more than corporate finance/corporate governance factors. Furthermore, Duration is negative and significant in this model and the effect disappears with the control of year and industry fixed effect. This suggests there can be an influence of duration of compensation on which year CAPEX is high or low. From what we know in literature, such year can be the one which the CEO has a large portion of his options/grants vested and the vesting of equity influence the choice of investments (Lewellen et al., 2017), and hence affect the level of CAPEX.

In addition, the control variables offer some insight into the factors that affect the risk preference of the firms. Although different independent variables affect each riskiness measures differently, several are consistently significant across all four models i.e. log of assets, leverage, book to market ratio, cash. Tenure is consistently insignificant in most models except for R&D models (where it is positive and significant).

I set up the experiment with the expectation that compensation duration may explain the negative relation between CEO age and risk-taking behaviors despite the presence of career concerns. Serfling (2014) and Yim (2013) find the negative relation between Age

and risky investments and the likelihood of M&A activity respectively. The inclusion of the variable Duration fails to meet the expectation of accounting for the deviation from career concerns theory in empirical evidence. Therefore, the career signal hypothesis, which dictates that CEOs are taking more risk to take chances for further success, prevails. This result support hypothesis H1a. Other possible explanations are differences between younger and older CEOs such as risk aversion level, wealth or the effect of other unknown omitted variables.

4.3. Duration with current compensation.

I rerun all four regression models with the original measure of Duration developed by Gopalan (2014). Table 5 reports the result of the procedure. Note that Duration with current compensation (Duration wcc) is only used here, all other analyses use Duration. I expect the substitution will not affect the other variables significantly.

Similar to the previous analyses, column 1 of table 5 shows the result of the model with Stock returns volatility. The significance of Age as expected does not change significantly with just a change of Duration measure; the coefficient remains negative and significant at 10% level. The same happens to Duration wcc. Its coefficient is -0.0021, which significant at 1% level, however smaller in absolute value than its counterpart in the previous analyses (-0.0026).

The change appears in the model with R&D intensity. The coefficient of Duration wcc is insignificant. Given that in the previous model (with equity only Duration) involving R&D intensity, Duration is significant and Cash compensation is insignificant, we can infer that the effect of compensation duration or compensation on R&D investment comes mostly from the equity rewards.

Similarly, Duration wcc have no statistically significant impact on CAPEX, which is similar to the equity-only Duration measure. However, the coefficient of Duration wcc comes very close to a weak relation with CAPEX ($p = 0.1245$) compared to the original

measure (p = 0.5299). Furthermore, cash compensation is insignificant in both models with CAPEX (the model which uses Duration and the model which uses Duration wcc). Therefore, there may be some relations that is worth exploring for future researches, even though I cannot find definitive evidence for them with this model and this dataset.

4.4. Age and Duration

Table 6 presents the univariate regression Duration on Age. The variable Age has a coefficient of -0.0042, which is negative and significant (p = 0.0009). This means a CEO who is ten years older tends to have her average compensation duration shorter by 0.04. This relation suggests that long duration contracts are granted significantly more to younger CEOs.

As I established in previous chapters, Age and Duration both correlate negatively with the riskiness measures of the firm. In that context, the negative relation between Age and Duration themselves suggests that the board is aware of the risk tolerance differences between young and older CEOs and may be given out suitable compensation contract already. It is possible that they perceive young CEOs to be more risk tolerant then set them longer duration compensation contract to discourage risk-taking behaviors and vice versa.

4.5. Interaction models.

In order to measure the different risk preference of different age group, I add interaction variables to the existing model. However, it is not yet clear the sign of the impact of Age on risk and onto each other, multiplying Age and Duration may cancel out some effect. Instead, I transform the continuous Age into an indicator variable for the group of young CEO (Young – for CEOs under 50 years old). The variable of Young times Duration will show the difference in the impact of duration on risk-taking activities between young CEOs and the rest of the sample.

If the interaction terms are significant, the model predicts that each unit of change in Duration would lead to a different change of riskiness measures for young CEOs than older CEOs. A positive coefficient would suggest riskiness measures for young CEOs would fluctuate more which means they are more sensitive to compensation duration than old CEOs.

Panel A of table 7 shows the regression results from the interaction models. I left out the CAPEX model as we do not see an impact of Duration in that model. In both models, the interaction variables are insignificant. This means there is no difference between young CEOs and others regarding the impact of compensation duration on risk-taking behaviors. This result does not support H2.

The insignificance of the interaction terms can be a result of multicollinearity between the interaction variables and the age indicator Young and Duration. For example, in the model with Stock returns volatility (without fixed effects), variance inflation factors of the interaction term and Young is 11.18 and 11.00 respectively. I also run the analysis for the interaction term Age*Duration. The coefficient is also insignificant and the variance inflation factor for the interaction term is 52.76.

4.6. Age group panels

In order to investigate more closely whether compensation contracts affect different CEOs age groups differently, I divide the sample into three age groups and analyze them separately. The groups of CEOs are Young (50 years old or younger), Middle (age, between 51 and 60 years old) Old (over 60 years old). I then rerun the regression models on riskiness measures for each group.

Table 8 shows the results of the analyses. Due to the grouping by Age, the coefficient of Age loses its significance in most of the models, except the ones in R&D intensity models for Middle and Old group. In these cases, they are negative and significant, which suggests the existence of the horizon problem in the Old group and maybe the older part of the Middle group.

Duration retains its negative and significant coefficients for half of the models (model 2, 3 and 6) and loses significance in the other half. In the regressions with Stock returns volatility, Duration is significant for the Middle (model 2) and the Old (model 3) group and not significant in the Young group (model 1). Furthermore, the coefficient of Duration is larger in term of absolute value in the Old group model (-0.0032) than the Middle group model (-0.0018), which means CEOs from the Old group is responding more sensitively to Duration. This is consistent with career concern theory, which states that young CEOs would focus more on performance for the assessment of the labor market while older CEOs with a shorter remaining career would emphasize compensation. In the regressions with R&D intensity, the pattern is somewhat similar in which younger CEOs put less emphasis on Duration. However, in this case, only the coefficient of Duration in the Old panel (model 6) is significant. This is a piece of evidence that supports H2. In short, this suggests that Age affects the interpretation of Duration and the reverse is not supported. Duration should not be a factor that drives negative relationship between Age and risk tolerance.

4.7. First time CEOs.

Regarding first time CEOs, the initial hypothesis is, first time CEOs would be a distinct minority who are new to the job and would have other more imminent concerns than their compensation. If that is the case, they may react differently to their compensation. However, through analysis, I find that most of the CEOs in the data are first time CEOs in that they have not been noted as a CEO before in Execucomp. In the data set, only 43 CEOs have appeared at least once before as a CEO in Execucomp. Only 118 CEOs have appeared in Execucomp as an executive before in any position.

I mark multiple times or seasoned CEOs by a value of 1 in an indicator variable while other CEOs have a value of 0. I then multiply this indicator variable with Duration to examine the sensitivity of riskiness measure to changes in Duration in the sub-group of seasoned CEOs. If the interaction terms are significant, the model predicts that each unit

of change in Duration would lead to a different change of riskiness measures for young CEOs than older CEOs. A positive coefficient would mean riskiness measures for multiple times CEOs would fluctuate more which means they are more sensitive to Duration than first time CEOs.

Panel B of table 7 shows the result of this analysis. I find the coefficients of the interaction terms to be insignificant with both Stock returns volatility and R&D intensity. This means there is no overall difference in the impact of Duration on risk-taking behaviors between first time and multiple times CEOs. This remark does not support H3. This can be the result of the straightforward interpretation of the vesting periods of equity compensation.

4.8. Duration and M&A activities.

In order to further examine the effect of Duration on risk-taking behaviors, I rerun the models in regards to M&A activities. In previous sections, I find longer Duration causes CEOs to be more conservative and take less risk. Therefore, I expect longer Duration to be associated with less risky M&A deals and smaller deal size. The sample of M&A activities includes 277 M&A deals made by S&P 1500 companies between 2013 and 2016. Table 9 reports the results of these regression models. Similar to the previous models, Panel A presents the OLS regression of Relative deal size on Age, Duration and other control variables. Panel B presents the logistic regressions with indicators variables as dependent variables i.e. Multiple (M&A deals in the same year), Different 2 digits or 4 digits SIC code (between the acquirer and the target, which are considered more risky M&A deals).

Across all models, Duration is not significant and has no power in explaining the size of M&A deals, whether the buying company conducts more than one M&A deals and whether the targets is in the same industry (same 2 digits, same 4 digits SIC code) with the acquirer. On the other hand, there is a negative and significant relation between Age and Multiple. In the same model, Tenure and ROA are both positive and significant which

means growing firms along with longer tenure CEOs (who are associated with more power over the board of directors) are more likely to bid in multiple M&A deals. This suggests Multiple can be signaling for empire building. In that context, the negative relation between Age and Multiple suggests younger CEOs may be more likely to engage in empire building behaviors. These are very preliminary results which have rooms for further analysis.

5. Limitation and suggestions for future researches

While the research contributes to the literature in CEO risk-taking behaviors, it has certain limitations. The first limitation is the small sample size. The analysis only uses four years of data (2013 to 2016) due to the limited availability of vesting schedule data. A longer sample period will improve the reliability of the results. Secondly, empirical tests in the study do not control for the effect of founder – CEOs on the data. Founder – CEOs have a unique stake in the firm, hence their risk portfolio involving business decisions can be different from the other CEOs. Such different risk portfolio may bias the result significantly.

Future researches in the area of literature can explore CEO risk-taking behaviors from other perspectives. Other studies can explore the effect of Age and Duration on the riskiness of CAPEX (some capital investments can be riskier than others), different hiring decisions or riskiness of projects selection.

6. Conclusion.

In this paper, I investigate corporate risk-taking behaviors in relation to the most important decision maker of a firm, the CEO. The characteristics that I focused on are CEO age and compensation contract, especially the duration of the contract. I find that CEO age has a significantly negative relation to overall firm risk and R&D investment. This means younger CEOs tend to show higher firm risk and to have more investment in R&D.

This is inconsistent with career concerns theory and consistent with the career signal hypothesis which suggests young CEOs risk failures for chances of significant success and gains reputation from such success.

I intend to use new controls to reconcile the empirical evidence with career concerns theory such as Duration, Tenure, and Overconfidence. However, this is not the case and the relation remains negative with all the control included. This may be due to the validity and influence of career signal hypothesis or other factors, e.g. differences in risk aversion level, wealth level between CEO age groups, other unknown omitted variables. These can be avenues for future analyses. On the other hand, by dividing the sample into three age groups (Young, Middle and Old), I find that older groups of CEOs put more emphasis and react more sensitively to compensation duration. The difference suggests that Age influences the interpretation of Duration, not the reverse. The pattern is consistent with career concerns theory.

In addition, there is a negative and significant relation between Duration and measures of risk-taking (Stock returns volatility, R&D intensity) in corporate activities. This suggests that longer-duration CEO compensation contracts lead to significantly lower overall firm risk and fewer R&D investments. At the same time, Duration is not significantly related to CAPEX, which means longer Duration does not lead to more investments, but more risky investments e.g. R&D, riskier projects.

I analyze the interaction between Duration and sub-groups of the CEO sample. I find that for each unit of change in Duration, the subsequent change in riskiness measures of younger CEOs is not significantly different from that of older CEOs. This is also the case with the first time – multiple time CEOs pair of sub-groups. These results may be explained by the straightforward interpretation of the vesting period of equity compensation. Furthermore, there is no association between Duration and any examined M&A related measure. However, I find evidence that younger CEO are more likely to engage in empire building behaviors.

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Appendix A. Variable definitions

Age	The age of the CEO in the year of the observation
Cash comp	Sum of salary and Bonus
Duration	Duration of compensation contract, following Gopalan et al. (2014), calculated by formula (1)
Duration wcc	Duration of compensation contract, following Gopalan et al. (2014), calculated by formula (2)
Overconfidence	Unexercised exercisable options CEOs divided by total compensation (from Execucomp)
Tenure	Difference between observation year and year become CEO
Dividends	Total dividends divided by total assets (from COMPUSTAT)
Cash	Cash holding of the company over total assets (from COMPUSTAT)
BM	Book to market ratio: total book value divided by total market value (from COMPUSTAT)
ROA	Returns on Assets: Net profits over total assets
Leverage	Long-term debt over total assets
Stock returns	Average of monthly stock returns for the year
Sale growth	Percentage changes of sales of observation year to the previous year
Log of assets	Logarithm to the base 10 of total asset
Stock returns volatility	Standard deviation of monthly stock returns of observation year
Idiosyncratic risk	Idiosyncratic component of stock returns volatility, calculated by taking the systematic risk component (by Market model) out of total risk (stock ret vol)
R&D Intensity	Total R&D expense over total assets
CAPEX	Total capital expenditure over total assets
Young	1 if CEO who are 50 years old or under, 0 otherwise
Middle	1 if CEO who are between 51 and 60 years old or under, 0 otherwise
Old	1 if CEO who are over 60 years old, 0 otherwise
2ndtimeCEO	1 if CEO has who held the position before, 0 otherwise
Relative deal size	Value of an M&A deal divided by total market value
Different n-digit SIC	1 if the M&A acquirer and target have the same n-digits (2 or 4 digits) SIC code, 0 otherwise
Multiple	1 if the M&A acquirer enters in multiple M&A deals that year, 0 otherwise

Appendix B. Tables

Table 1. Descriptive statistics

Label	N	Mean	Std Dev	Sum	Minimum	Maximum
Age	5207	57.08	6.92	297238.00	34.00	93.00
Duration	5207	2.19	0.71	11379.00	0.00	10.00
Duration wcc	5207	1.72	0.67	8946.00	0.00	9.39
Cash comp	5207	0.23	0.20	1197.00	0.00	1.00
Overconfidence	5207	1.66	3.76	8621.00	0.00	72.25
Tenure	5207	7.47	7.22	38901.00	0.00	53.00
Cash	5207	0.10	0.11	523.57	0.00	0.75
Dividends	5207	0.02	0.03	84.93	0.00	1.17
BM	5207	0.45	0.38	2325.00	-2.80	6.98
ROA	5207	0.05	0.09	239.08	-1.33	0.46
Leverage	5207	0.23	0.21	1178.00	0.00	3.00
Stock returns	5207	0.01	0.03	73.59	-0.43	0.23
Sale growth	5207	0.07	0.30	346.82	-0.81	9.15
Log of assets	5207	3.57	0.73	18614.00	1.65	6.41
Stock returns volatility	5207	0.08	0.04	407.33	0.00	0.72
Idiosyncratic risk	5189	0.07	0.04	347.62	0.00	0.58
R&D intensity	2975	0.04	0.06	119.50	0.00	0.59
CAPEX	5207	0.04	0.05	220.30	0.00	0.48

Table 2. T-tests results

This table presents the results of t-tests for difference in mean between three groups: Young, Middle and Old. For brevity, group 1, 2, 3 denotes the Young, Middle, Old groups respectively. Column 2 compares of the mean of Young to Middle. Column 3 compares of the mean of Middle to Old. Column 1 compares of the mean Old to Young.

	Young	p-value 1 vs 2	(2)	Middle	p-value 2 vs 3	(3)	Old	p-value 3 vs 1	(1)
Duration	2.2048	0.8858	=	2.2010	0.0259	>	2.1444	0.0682	<
Stock returns volatility	0.0843	<.0001	>	0.0775	0.3121	=	0.0762	<.0001	<
R&D intensity	0.0554	<.0001	>	0.0371	0.7343	=	0.0363	<.0001	<
CAPEX	0.0399	0.0669	<	0.0431	0.5221	=	0.0421	0.2504	=
Current comp	0.2413	0.0022	>	0.2177	0.0001	<	0.2469	0.5296	=
Log_assets	3.3574	<.0001	<	3.6260	0.2334	=	3.5979	<.0001	>
BM	0.4286	0.1155	=	0.4531	0.4180	=	0.4442	0.3263	=
Leverage	0.2141	0.0159	<	0.2350	0.0030	>	0.2164	0.7993	=
Overconfidence	1.7257	0.2319	=	1.5254	0.0067	<	1.8664	0.4636	=

Table 3. Correlation table.

	Age	Cash Comp	Dur.	Dur. wcc	Over conf	Ten.	Cash	Div.	BM	ROA	Lev	Stock Ret.	Sale Gr.	log asset	Stock Ret Vol	Idios. risk	R&D	CAPEX
Age	1.00																	
Cash comp	0.04	1.00																
Duration	-0.05	-0.10	1.00															
Duration wcc	-0.09	-0.42	0.84	1.00														
Overconfidence	0.04	0.02	-0.05	-0.04	1.00													
Tenure	0.45	0.07	-0.03	-0.09	0.15	1.00												
Cash	-0.03	0.02	-0.05	-0.03	0.19	0.05	1.00											
Dividends	0.03	0.01	0.04	0.03	-0.13	-0.05	-0.14	1.00										
BM	0.01	0.16	-0.04	-0.10	-0.15	-0.01	-0.17	0.10	1.00									
ROA	0.03	-0.09	0.02	0.02	0.12	0.06	0.16	-0.02	-0.25	1.00								
Leverage	-0.02	-0.16	0.03	0.12	-0.02	-0.11	-0.23	0.11	-0.25	-0.14	1.00							
Stock returns	-0.01	0.00	-0.01	-0.04	0.14	0.02	0.09	-0.13	-0.22	0.14	-0.07	1.00						
Sale growth	-0.02	0.05	-0.03	-0.04	0.12	0.04	0.09	-0.10	-0.10	0.07	0.00	0.12	1.00					
Log of assets	0.06	-0.35	0.16	0.29	-0.22	-0.10	-0.38	0.18	0.11	-0.05	0.17	-0.08	-0.11	1.00				
Stock returns volatility	-0.05	0.17	-0.11	-0.13	0.08	-0.02	0.16	-0.13	0.15	-0.28	0.04	0.11	0.08	-0.33	1.00			
Idiosyncratic risk	-0.07	0.20	-0.11	-0.14	0.10	-0.01	0.17	-0.15	0.16	-0.29	0.02	0.10	0.11	-0.36	0.95	1.00		
R&D	-0.11	0.02	-0.02	0.01	0.11	0.06	0.44	-0.17	-0.12	-0.19	-0.19	0.10	0.16	-0.22	0.22	0.22	1.00	
CAPEX	-0.01	0.00	0.03	0.02	-0.01	-0.03	-0.09	-0.03	-0.02	-0.08	0.10	-0.08	-0.07	-0.06	0.12	0.14	-0.15	1.00

Table 4. Duration and riskiness measure

This table reports the OLS regression results with riskiness measures as dependent variables. Dependent variables of each regression model are at the top of each result column. The data consists of panel data of CEO-year observation on an annual basis. All models include industry (2 digits SIC code) and year fixed effects. All variables are described in appendix A. Intercept not reported. 0.0000 denotes coefficients whose absolute values are smaller than $5x10^{5}$. Standard errors are in parentheses. *, **, *** denotes statistical significance at 1%, 5% and 10% respectively.

	Stock returns volatility	Idosyncratic risk	R&D intensity	CAPEX
	(1)	(2)	(3)	(4)
Age	-0.0001*	-0.0002***	-0.0007***	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Duration	-0.0026***	-0.0022***	-0.0024**	-0.0004
	(0.0007)	(0.0006)	(0.0012)	(0.0007)
Tenure	-0.0001	0.0000	0.0005***	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Dividends	-0.0614***	-0.0502**	-0.0624*	-0.0231
	(0.0174)	(0.0198)	(0.0368)	(0.0184)
Cash comp	0.0073***	0.0092***	-0.0043	0.0029
	(0.0026)	(0.0024)	(0.0047)	(0.0028)
Cash	0.0311***	0.0326***	0.1354***	-0.0299***
	(0.0050)	(0.0046)	(0.0084)	(0.0053)
Overconfidence	0.0003**	0.0004***	0.0002	0.0000
	(0.0001)	(0.0001)	(0.0002)	(0.0001)
BM	0.0226***	0.0200***	-0.0347***	-0.0140***
	(0.0015)	(0.0013)	(0.0036)	(0.0016)
ROA	-0.1023***	-0.0982***	-0.1694***	0.0005
	(0.0056)	(0.0051)	(0.0109)	(0.0059)
Leverage	0.0261***	0.0216***	-0.0385***	-0.0072**
	(0.0028)	(0.0025)	(0.0054)	(0.0029)
Stock returns	0.2951***	0.2465***	0.0124	-0.0997***
	(0.0180)	(0.0169)	(0.0328)	(0.0191)
Sale growth	0.0088***	0.0106***	0.0116***	-0.0006
	(0.0016)	(0.0014)	(0.0024)	(0.0017)
Log assets	-0.0164***	-0.0166***	-0.0026*	-0.0068***
	(0.0009)	(0.0008)	(0.0015)	(0.0009)
R^2	0.3824	0.3969	0.4462	0.5055
N	5207	5189	2975	5207
Fixed effects	IndxYear	IndxYear	IndxYear	IndxYear

Table 5. Duration with current compensation

This table reports the OLS regression results with riskiness measures as dependent variables. Dependent variables of each regression model are at the top of each result column. The data consists of panel data of CEO-year observation on an annual basis. All models include industry (2 digits SIC code) and year fixed effects. All variables are described in appendix A. Intercept not reported. 0.0000 denotes coefficients whose absolute values are smaller than $5x10^{5}$. Standard errors are in parentheses. *, **, *** denotes statistical significance at 1%, 5% and 10% respectively.

	Stock returns volatility	Idiosyncratic risk	R&D	CAPEX
	(1)	(2)	(3)	(4)
Age	-0.0001*	-0.0002***	-0.0006***	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Duration wcc	-0.0021***	-0.0017**	-0.0004	-0.0013
	(0.0008)	(0.0007)	(0.0014)	(0.0008)
Tenure	-0.0001	0.0000	0.0005***	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Dividends	-0.0619***	-0.0511**	-0.0634*	-0.0231
	(0.0174)	(0.0198)	(0.0368)	(0.0184)
Cash comp	0.0054*	0.0076***	-0.0042	0.0016
	(0.0027)	(0.0025)	(0.0049)	(0.0029)
Cash	0.0316***	0.0330***	0.1354***	-0.0296***
	(0.0050)	(0.0046)	(0.0084)	(0.0053)
Overconfidence	0.0003**	0.0004***	0.0002	0.0000
	(0.0001)	(0.0001)	(0.0002)	(0.0001)
BM	0.0227***	0.0201***	-0.0344***	-0.0140***
	(0.0015)	(0.0013)	(0.0036)	(0.0016)
ROA	-0.1028***	-0.0986***	-0.1691***	0.0003
	(0.0056)	(0.0051)	(0.0109)	(0.0059)
Leverage	0.0264***	0.0219***	-0.0381***	-0.0072**
	(0.0028)	(0.0025)	(0.0054)	(0.0029)
Stock returns	0.2944***	0.2459***	0.0130	-0.1004***
	(0.0181)	(0.0170)	(0.0329)	(0.0191)
Sale growth	0.0089***	0.0107***	0.0116***	-0.0005
	(0.0016)	(0.0014)	(0.0024)	(0.0017)
Log of assets	-0.0163***	-0.0165***	-0.0030*	-0.0065***
	(0.0009)	(0.0008)	(0.0016)	(0.0009)
R^2	0.3813	0.3961	0.4455	0.5057
N	5207	5189	2975	5207
Fixed effects	IndxYear	IndxYear	IndxYear	IndxYear

Table 6. Duration and Age regression

This table reports the OLS regression results with Duration as dependent variables

	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	2.4558	0.0816	30.08	<.0001
Age	-0.0047	0.0014	-3.34	0.0009
N	5207		F value	11.14
R^2	0.0021		P (F-test)	0.0009

Table 7. Interaction terms

This table reports the OLS regression results with riskiness measures as dependent variables. Dependent variables of each regression model are at the top of each result column. The data consists of panel data of CEO-year observation on an annual basis. All models include industry (2 digits SIC code) and year fixed effects. All variables are described in appendix A. Intercept not reported. 0.0000 denotes coefficients whose absolute values are smaller than $5x10^{5}$. Standard errors are in parentheses. *, **, *** denotes statistical significance at 1%, 5% and 10% respectively.

	Stock returns volatility (1)	R&D intensity (2)	Stock returns volatility (3)	R&D intensity (4)
Age			-0.0001*	-0.0007***
			(0.0001)	(0.0001)
2nd_time_CEO_1			-0.0021	-0.0004
			(0.0126)	(0.0214)
Ceo2nd*Duration			0.0051	-0.0043
			(0.0054)	(0.0089)
Young	0.0029	0.0100		
	(0.0041)	(0.0070)		
Young*Duration	0.0000	-0.0003		
	(0.0018)	(0.0030)		
Duration	-0.0025***	-0.0020	-0.0027***	-0.0023*
	(0.0007)	(0.0013)	(0.0007)	(0.0012)
Tenure	-0.0001	0.0003**	0.0000	0.0005***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Dividends	-0.0620***	-0.0672*	-0.0648***	-0.0638*
	(0.0174)	(0.0368)	(0.0174)	(0.0368)
Cash comp	0.0071***	-0.0051	0.0072***	-0.0041
	(0.0026)	(0.0047)	(0.0026)	(0.0047)
Cash	0.0311***	0.1354***	0.0313***	0.1354***
	(0.0050)	(0.0084)	(0.0050)	(0.0084)
Overconfidence	0.0003**	0.0002	0.0003**	0.0002
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
BM	0.0227***	-0.0352***	0.0226***	-0.0348***
	(0.0015)	(0.0036)	(0.0015)	(0.0036)
ROA	-0.1020***	-0.1690***	-0.1018***	-0.1700***
	(0.0056)	(0.0109)	(0.0056)	(0.0109)
Leverage	0.0262***	-0.0388***	0.0257***	-0.0378***
	(0.0028)	(0.0054)	(0.0028)	(0.0054)
Stock returns	0.2961***	0.0159	0.2936***	0.0132
	(0.0180)	(0.0329)	(0.0181)	(0.0329)
Sale growth	0.0088***	0.0119***	0.0088***	0.0115***
	(0.0016)	(0.0024)	(0.0016)	(0.0024)
Log of assets	-0.0163***	-0.0026*	-0.0164***	-0.0026*
	(0.0009)	(0.0015)	(0.0009)	(0.0015)
R^2	0.3824	0.4448	0.3833	0.4469
N	5207	2975	5207	2975
Fixed effects	IndxYear	IndxYear	IndxYear	IndxYear

Table 8. Age group panels

This table reports the OLS regression results with riskiness measures as dependent variables. Dependent variables of each regression model are at the top of each result column. The data consists of panel data of CEO-year observation on an annual basis. All models include industry (2 digits SIC code) and year fixed effects. All variables are described in appendix A. Intercept not reported. 0.0000 denotes coefficients whose absolute values are smaller than $5x10^{5}$. Standard errors are in parentheses. *, **, *** denotes statistical significance at 1%, 5% and 10% respectively.

	Stock returns volatility			R&D intensity		
	Young (1)	Middle (2)	Old (3)	Young (4)	Middle (5)	Old (6)
Age	0.0011*	0.0000	-0.0001	0.0003	-0.0009**	-0.0012***
	(0.0005)	(0.0002)	(0.0002)	(0.0009)	(0.0004)	(0.0004)
Duration	-0.0023	-0.0018*	-0.0032***	0.0007	-0.0018	-0.0045**
	(0.0022)	(0.0010)	(0.0009)	(0.0031)	(0.0019)	(0.0019)
Tenure	0.0000	-0.0001	0.0000	0.0005	0.0003	0.0007***
	(0.0004)	(0.0001)	(0.0001)	(0.0005)	(0.0002)	(0.0002)
Dividends	-0.0803	-0.0431**	-0.0933***	-0.0120	-0.1094*	-0.0245
	(0.0847)	(0.0204)	(0.0314)	(0.1296)	(0.0572)	(0.0479)
Cash comp	0.0078	0.0087**	0.0054	0.0095	0.0002	-0.0169**
	(0.0084)	(0.0037)	(0.0041)	(0.0131)	(0.0072)	(0.0074)
Cash	0.0317**	0.0338***	0.0275***	0.1071***	0.1587***	0.1099***
	(0.0153)	(0.0064)	(0.0094)	(0.0210)	(0.0115)	(0.0158)
Overconfidence	0.0005	0.0000	0.0005**	-0.0002	0.0002	0.0003
	(0.0004)	(0.0002)	(0.0002)	(0.0006)	(0.0003)	(0.0003)
BM	0.0158***	0.0233***	0.0259***	-0.0527***	-0.0290***	-0.0347***
	(0.0045)	(0.0019)	(0.0032)	(0.0100)	(0.0047)	(0.0071)
ROA	-0.1011***	-0.1089***	-0.0893***	-0.1708***	-0.1408***	-0.2281***
	(0.0143)	(0.0077)	(0.0109)	(0.0273)	(0.0143)	(0.0225)
Leverage	0.0086	0.0293***	0.0329***	-0.1025***	-0.0281***	-0.0201*
	(0.0083)	(0.0035)	(0.0056)	(0.0149)	(0.0071)	(0.0103)
Stock_ returns	0.2014***	0.3262***	0.3063***	0.0172	-0.0142	0.0518
	(0.0464)	(0.0235)	(0.0368)	(0.0784)	(0.0435)	(0.0673)
Sale growth	0.0242***	0.0038**	0.0152***	0.0496***	0.0073**	0.0109**
	(0.0063)	(0.0018)	(0.0030)	(0.0087)	(0.0028)	(0.0045)
Log assets	-0.0148***	-0.0165***	-0.0160***	-0.0068	-0.0014	-0.0028
	(0.0030)	(0.0011)	(0.0016)	(0.0045)	(0.0021)	(0.0028)
R^2	0.2926	0.4520	0.4174	0.5814	0.4235	0.4982
N	836	2874	1497	538	1620	817
Fixed effects	IndxYear	IndxYear	IndxYear	IndxYear	IndxYear	IndxYear

Table 9. M&A analysis

This table reports the regression results with M&A related characteristics as dependent variables. Dependent variables of each regression model are at the top of each result column. The data consists of panel data of CEO-year observation on an annual basis. Panel A presents an OLS regression while Panel B present results from logistic regressions with denoted dependent variables. Model 1 includes industry (2 digits SIC code) and year fixed effects. All variables are described in appendix A.. The fitness measure for logistic regression are t-jur pseudo R^2. Standard errors are in parentheses. *, **, *** denotes statistical significance at 1%, 5% and 10% respectively.

	Panel A: OLS regression	Panel B: Logistic regressions		
	Relative deal size (1)	Diff 2 digit SIC (2)	Diff 4 digit SIC (3)	Multiple (4)
Age	0.0000	0.0244	0.0112	-0.0784***
	(0.0044)	(0.0264)	(0.0265)	(0.0298)
Duration	-0.0188	0.1825	-0.1444	-0.2968
	(0.0366)	(0.2300)	(0.2593)	(0.2441)
Tenure	-0.0004	-0.0075	0.0002	0.1098***
	(0.0040)	(0.0242)	(0.0242)	(0.0276)
Dividends	-4.1800**	38.4443***	26.4923**	23.1959**
	(2.0309)	(9.8034)	(10.8683)	(9.8089)
Current comp	0.3941**	0.2951	2.2477**	-1.5260*
	(0.1616)	(0.8207)	(0.9139)	(0.8968)
Cash	0.1231	-1.4629	-4.1400**	-9.8927***
	(0.3303)	(1.8742)	(1.8086)	(2.7353)
Overconfidence	0.0082	0.0161	0.0037	-0.0258
	(0.0076)	(0.0250)	(0.0249)	(0.0436)
BM	0.2611**	0.3660	0.2872	1.0250
	(0.1055)	(0.6805)	(0.6402)	(0.7011)
ROA	-0.7358	12.7829***	9.2699***	7.1903**
	(0.4511)	(3.5676)	(3.1321)	(3.6438)
Leverage	1.0386***	2.0534**	0.2362	0.9495
	(0.1678)	(0.9330)	(0.8895)	(0.9524)
Stock returns	0.7077	0.1902	6.9681	7.4245
	(0.9934)	(5.9644)	(5.8102)	(6.3279)
Sale growth	0.1889**	-0.6824	-0.4809	1.9207**
	(0.0785)	(0.5328)	(0.5369)	(0.8131)
Log of assets	0.0036	-0.5400**	-0.1127	-0.0087
	(0.0430)	(0.2189)	(0.2257)	(0.2196)
R^2	0.3536	0.0767	0.0872	0.2197
N	277	277	277	277
Fixed effects	IndxYear	No	No	No